A firm level study of the determinants of export performance in machinery and transport equipment industry of India

Pradeep Kumar Keshari and Mridul Saggar

21. May 2013

A Firm Level Study of the Determinants of Export Performance in Machinery and Transport Equipment Industry of India

Pradeep Kumar Keshari[1],
(Researcher, Centre for Policy Research, New Delhi 110 021)
and
Mridul Saggar,
(Research Scholar, Jawaharlal Nehru University, New Delhi 110 067)

Introduction

The paper seeks to analyse the determinants of export performance for 55 large firms operating in the machinery and transpoprt equipment (SITC-7) Industry of India. The study follows the neo-factor proportion and neo-technology approaches.[2] These approaches came into vogue as the Heckscher-Ohin (H-O) theorem, due to its restrictive assumptions, was found incapable of explaining real world phenomenon of monopolistic completion in the arena of international trade and foreign investment. Under the assumptions of the H-O theorem, such a perfect competition and perfect foresight, constant returns to scale, absence of product differentiation, all firms in an industry will have equal access of technology, factors and product markets. As a result they are expected to perform in similar fashion.

The recent advances in the literature, however, have opened up the scope of highlighting differences in the firm level behaviour. The "neo-technology" and "neo-factor proportion" theories take cognizance of market imperfections such as product differentiation, economies of scale, technology, and skill intensity.[3] These imperfections are accepted at the firm level as well, so that we enter into a model akin to the real world situation, where two firms are seldom alike. Firms differ with respect to scale economies in production and exporting, technological capabilities, marketing efforts, skill intensity, etc. These differences result in markedly different export performance by different firms.

The empirical studies on the subject, however, are few for both developed and developing countries. They are by Hirsch (1971), Glejser et al. (1980), Lall and Kumar (1981) and Lall (1986). Hirsch (1971) has analysed inter-country, inter-industry and inter-firm differences in export performance for six industries in three small but developed countries-Denmark, Holland and Israel. He uses rank correlations method to establish relationship between export performance and firm level factors such as skill, R & D, size, marketing efforts, etc. Glejser et al. (1980) analyses the export behaviour of 1446 exporters belonging to the manufacturing sector of Belgium. Their study relates to the year 1974, and uses an ordinary least square method. Findings of the study show that the firm size, domestic concentration, product differentiation, lack of information have

1The authors are greatly indebted to Prof.V.L. Rao of the Centre for Policy Research, New Delhi for his valuable comments and encouragement during the course of writing this paper. However, the responsibility of the paper is entirely borne by the authors.

2See Hirsch (1977), for a useful summary of the literature on the neo-factor proportions and neo-technology theories of trade. Refer to Lall (1981) for a review on the empirical testing of such theories Chapter 7.

3Ibid.

negative impact on export performance, whereas existence of foreign subsidiaries and local firms near harbours and canals have positive influence.

Lall and Kumar (1981) investigate the influence of R & D, size and profitability of export activity of 100 largest Indian engineering firms for two average periods 1966-68 and 1976-1978. They report that R & D activity has negative impact on export performance (export-sales ratio) but size and profitability do not approach statistical significance in both the periods. However, the result relating to R & D activity with export performance needs be treated with caution because a dummy variable has been used to capture R & D activity of the firms. But, using dummy in place of actual figure is not a satisfactory method, for a dummy may capture any omitted variable, as the explanatory power of the model is low.

Lall (1986) employs number of variables to explain export-performance with the cross section sample of top 100 engineering firms and 45 chemical firms. The empirical analysis has been conducted by averaging the data on the dependent variable-exports as percentage of sales –for two years 1978-79, and 1979-80. But, most of the explanatory variables are related to the year 1978-79. The regression equation related to engineering sample shows only size, number of licensing agreement for technological collaboration (LIC) and R & D variables to be significant; size and LIC are positively related but R & D is negatively related. Besides, advertising intensity and subsidy have positive influence on export performance but are significant only at 10 per cent. However, the explanatory power of the model is low due to low R^2 and F-value is just significant.

The reasons for focusing on the Indian machinery and transport equipment industry and the distinguishing features of our study vis a vis above mentioned Indian studies are as follows:

- The period chosen for the study saw the implementation of the recommendations of the Alexander Committee (1978) and Tandon Committee (1980). The recommendations included the preferential treatment of the export sector in regard to licensing facilities, duty exemptions, the MRTP regulations, technology imports, rules relating to royalty and dilution of equities in MNCs/foreign companies and all concessional facilities relating to the availability and pricing of imputs (Sen, 1982). Now, since one aspect of our study analyses the impact of access of foreign technology on export performance of firms, the use of a recent period in our study captures the effect of liberalized technology import policy of the government on export promotion.
- The engineering industry as defined by the Association of Indian Engineering Industry (AIEI) includes simple metal and metal products as well as sophisticated machinery and equipment producing sectors which differ widely in their technological capacity. Hence, it would be wrong to compare the export performance of firms belonging to these sectors on the basis of their technological capacity. Although Lall's study uses dummy variable method to isolate two sectors, the present paper finds it more appropriate to concentrate only on "Machinery and Transport Equipment" sector (SITC-7). Other reasons for focusing on this sector are: (i) this sector has become increasingly important in the export basket of engineering goods during the last two and half decades. Exports on non-electrical machinery, electrical apparatus and appliances and

transport equipment as percentage of total engineering exports increased from 49.5 in 1960-61 to 70.9 in 1986-86.[4]; (ii) from the point of view of foreign collaborations in the engineering industry this sector has occupied relatively important place vis-à-vis other groups. Between 1970 and 1984 the number of foreign collaborations in the group of "Machinery and Transport Equipment" increased from 81 to 410. However, in other groups comprising of metallurgical industries and commercial office and household equipment, the number of foreign collaborations increased only from 25 in 1970 to 77 in 1984.[5]

- Our study analyses export performance by pooling the cross section data over three years, therefore it also takes into account the analysis of export performance over time.
- To capture the effects of skill, capital intensity and managerial and marketing effort undertaken by the firms on export performance, the study also introduces some new proxy measures such as wages per employee, managerial remuneration as a ratio of wage bill, and value added per employee.

Variables and Hypotheses

The dependent variable, export performance, is defined as the ratio of exports to sales in each year.[6] The explanatory variables of the study have been divided into three sets; their measurement and a prior relationship with the dependent variable are discussed below.

The first set of variables deals with in-house technological and marketing effort made by the firms. In the empirical literature related to technology and trade, in-house technological efforts resulting into the development of new products or processes are captured by research and development (R&D) expenditure as a ratio of sales or number of R & D personnel as a ratio of total employment of a firm or industry.[7] However, the product or process innovation by Indian firm is not significant. Yet, they do undertake activities like design imitation and assimilation, raw material adaptation, process down scaling, equipment modification, slight changes in product, upgrading of components, product diversification and so on.[8] Above mentioned activities may either result from formal research and development effort of the firm or from shop-floor production engineering, and learning by doing on the part of the skilled workers? In any case, they are important in conferring higher productivity to the enterprises concerned, as well as to enable them to offer diverse range of products.[9] The main markets for these products,

4See for data source Nayyar (1976) and Davies (1986).

5See for data regarding the number of foreign collaborations approved by Government of India, Indian Investment Centre, 1986.

6See Hirsch (1971) for the criteria of defining export performance

7See Gruber, Mehta and Vernon (1967), Gruber and Vernon (1970), Hirsch (1971), Hufbauer (1970), etc. for the empirical literature relating to R & D and export performance .

8See Lall and Mohammed (1983)

9Ibid

apart from domestic market, are other developing countries which are generally placed lower on the industrialization scale. The firms which undertake these efforts first in an industry enjoy certain monopoly advantage over a period of time vis-à-vis other firms in India as well as in other developing countries. We measure the R & D effort by R & D expenditure as a ratio of total sales of the firm and approximate remaining type of technological activities such as "learning by doing" and "production engineering" by an additional variable, wages per employee.[10]

It is shown below that the wages per employees is a function of the proportion of skilled employees in the total employment of a firm, we define the wages per employee in the following manner:

$W/N = (w_1 N_1 + w_2.N_2) /N = w_1 (N_1/N) + w_2.(N_2/N)$, where

W	=	total wage bill of a firm;
w_1	=	wage rate of unskilled employees;
w_2	=	wage rate of skilled employees
N_1	=	number of unskilled employees;
N_2	=	number of skilled employees
N	=	$N_1 + N_1$ = total number of employees in the firm;
W/N	=	wages per employee;
N_1/N	=	Ratio of unskilled employees in total employment;
N_2/N	=	Ratio of skilled employees in total employment or skill intensity;

Now, if w_1 and w_2 are competitively determined and if $w_2 > w_1$, then difference in the skill intensity of the firm will be reflected in variations in wages per employee across firms. Similarly, if w_1 and w_2 remain constant over the period of study, the changes in the skill intensity of a firm will result into the changes in wages per employee.

We construct a separate variable, the managerial remunerations as a ratio of total wage bill (MR/W) to take account of some of the marketing efforts undertaken by the firms. As the export marketing of the sophisticated items like machinery and transport equipment are extremely difficult, the alert, technological oriented managers with a flair for marketing products are as vital as the technological efforts made by the firms. We hypothesise that the firms which devote more energy in marketing the product with help of their able managers will also exhibit better export performance over time. Unfortunately, the separate data on export marketing or export management is not available and so we can only use a rough proxy like MR/W.

Now considering the fact that the export competitiveness in "Machinery and Transport Equipment" industry depends on the ability to use frontier technology for product design, the Indian firms cannot succeed on the export front by their adaptive kind of technological efforts. Therefore, they complement their in-house technological efforts

---

10See Hirsch (1974) for the use of wages per employee as a neo-technological determinant of trade. For a more detailed discussion on value-added per employee as a combined measure of physical and human capital intensity see H.B. Lary (1968) chapter II.

with the import of technology from more advanced foreign firms. These technology imports are effected through various types of foreign collaborations, and their different combinations. In general, these collaborations also include clauses for access to market, and marketing know-how.

We employ a second set of proxy variables in order to measure access to foreign technology, market and marketing know-how. The first among them is the number of licensing agreements (LIC), for purely technological collaborations, held by a domestic firm, and second is the ratio of equity held by foreign companies in a domestic firm, FE.

It is postulated that the technological progress made by the firms will be positively related to their export performance irrespective of whether it is because of foreign collaboration agreements or due to firms own efforts taking the form of higher R & D expenditure as a ratio of sales, or the from the greater employment of skilled labour as a ratio of total employment.

The third set includes only one variable that is related to the capital intensity of the firms. Following Lary's neo-factor proportion approach, the variable combines physical and human capital intensities of a firm into one measure, value added per employee (VA/N).[11] VA/N can also be expressed as the product of capital productivity (VA/K) and capital stock per employee.

VA /N	=	(VA / K) (K/N), where
VA	=	Value or production – intermediate inputs used
	=	N.w + K.r
K	=	Stock of capital employed by a firm
N	=	Number of employees employed by a firm
w	=	Wage rate
r	=	Capital rental

VA/N varies across the firms or in a firm over time due to changes in (i) capital stock per employee or (ii) capita productivity. Given a certain stage of technology the capital productivity differs for two reasons, (i) if labour varies in quantity; (ii) if labour varies in quality. In the first case, VA/N is affected marginally because a rise in VA/N due to increase in N is checked by a decrease in K/N. However, the variation in quality of labour will not affect K/N but VA/K provided the employment of better (or worse) skills is reflected in higher (or lower) wage rate and capital rental remains the same across the firms and over time. Now, since the greater opportunities for "learning by doing" is associated with greater mechanization, higher employment of stock of capital per worker may improve export performance. Similarly, employment of better skill by a firm or improvement in skill over time, increases the productivity of capital and hence increases its competitiveness vis-à-vis other firms.

Methodology

Sample and Data Sources

11See H.B. Lary (1968), Chapter II for a more detailed discussion on value-added per employee as a combined measure of physical and human capital intensity.

The study consists of 55 firms belonging to "Machinery and Transport Equipment" industry for which data on all the variables were readily available. The firms were identified as the producers of machinery and transport equipments on the basis of their main products. The information on the main products of a firm was obtained from AIEI, 1984 directory of member firms. Each of these firms had average annual sales of Rs.500 lakh or more and also exported some proportion of its sales during 3 years period 1981-84. Data on all the variables are pooled for three years, 1981-82, 1982-83, 1983-84.[12]

Data on exports, sales, production, intermediate inputs, wage bill, managerial remuneration, and foreign equity were collected from annual balance sheets of these companies and AIEI Publication, "Top 100 Engineering Companies", 1982-83, 1983-84 & 1984-85. Thereafter, information on number of licences and R & D expenditure for each of the five years were obtained from DGTD (Directorate General of Technological Development) and DST (Department of Science and Technology) respectively. Some questionnaires and the AIEI directory, 1984 of member firms provided the data on number of employees of the firms during each year of the study.

The Model

The model employed to study export performance includes two linear regression equation to be estimated by Ordinary Least Squares (OLS) method. Two equations are estimated in order to avoid strong multicollinearity between VA/N and W/N, and VA/N and MR/W. The equations estimated are:

$$(E/S)_{it} = a + b.\,(VA/N)_{it} + b(RD/S)_{it} + b(LIC)_{it} + b(FE)_{it} + U_{it}$$

$$(E/S)_{it} = a + b\,(W/N)_{it} + b(MR/W)_{it} + b(RD/S)_{it} + b\,(LIC)_{it} + b(FE)_{it} + U_{it}$$

Where, $i = 1, \ldots, 55$; $t = 1, 2, 3$, U_{it} is error term

E/S is defined as the exports to sales ratio, both at current prices, for each year of the study.

12This kind or pooling involves the assumption that the intercepts and slopes of the regression equation do not change over time. To test the assumption, the F-ratio is calculated as (G.S.Maddala, Econometrics, 1977, p.p. 322-23):

$$F = \frac{(S_2 - S_1) / (KT-K)}{S_1 / (NT-KT)}$$

where,

S_1 = Unrestricted residual sum of square with NT-KT degree of freedom

S_2 = Restricted residual sum of square with NT-K degree of freedom

N = Number of observations

K = Number if parameters to be estimated

T = Number of years for which pooling is done

The F-ratio is found insignificant indicating pooling exercise to be appropriate.

Neo-factory Proportion Variable (VA/N): is defined as the value added per employee where value added is calculated by subtracting value of intermediate inputs from the value of production in each year.
Research and Development Intensity (RD/S): is defined a research and development expenditure as a ratio of sales.
Skill Intensity (W/N): is defined as wages as a ratio of total employment of a firm.

Managerial Intensity (MR/W): is defined as managerial remuneration as a ratio of total wage bill of a firm in a year.

Technological Collaborations (FE): are measured by value of equity shares held by foreign firms as a ratio of paid up capital of a domestic firm.

Results

Table-1 gives the OLS estimation results which show that both the equations of the model are significant at one percent level. Besides, the second equation which includes two additional variables MR/W apart from the common variables fits better which is reflected in its higher R^2.

Table-1: Determinants of Export Performance

Variable	Equation (1)	Equation (2)
RD/S	-0.095 (.023)**	-0.067 (.823)**
W/N		0.539 (4.16)*
MR/W		0.728 (4.05)*
LIC	0.344 (3.94)*	0.328 (3.65)*
FE	-0.182 (2.85)*	-0.193 (2.61)*
VA/N	0.781 (2.99)*	
Constant	-.0.69 (-0.71)**	-0.36 (-0.59)**
R^2	0.69	-0.76
F	71.1*	95.4*
Durbin – Watson:	1.83*	1.85*

Note: t – values are given in parentheses; * = significant at one percent and **= insignificant.

RD/S is not statistically significant, indicating that the formal R & D expenditure is not an important factor in explaining export performance of firms in the Machinery and Transport Equipment industry. The reasons for this are not difficult to find. First, Indian manufacturers in general spend a small proportion of their total sales on formal research and development. The neglect of research and development effort originates from the fact of India's protected and large domestic market. Second, most of the technical change in Machinery and Equipment industry is product centered. Firm level evidences suggest that Indian firms have rarely been able to keep with international frontiers in product technology by their own efforts.[13] Thus, for the firms of "Machinery and Transport Equipment" industry, the present level and kind of in-house R & D expenditure may be distorted and thereby producing unpredictable influences on export performance. Fourth, other forms of technological activities may be more important than formal R D effort. This is also discernible from the fact that the skill intensity variables, which are discussed below, are showing significant positive influence on export performance.

Our study shows a positive and significant influence of LIC, but a negative and significant impact of FE on export performance of firms during 1981-84. It shows that firms having more access to technology and market abroad as a result of technological collaboration agreements are performing better on the export front, while the firms having the same on account of foreign equity participation are more interested in selling in the domestic market. The former is in accordance with our hypothesis regarding the foreign collaborations, but the latter contradicts it. The reasons for this contradiction could be: a) The decision to export or not to export by foreign dominated firms is often influenced by the world-wide interests of their parent firms (which in many cases are multinationals). These interests may not always favour exports from India. b) The large and protected Indian market offers infinite possibilities for any firm to sell their product at a large premium. This premium can be better exploited by foreign equity firms on account of their superiority in marketing and manoeuvring in order to sell the product to public, as well as to private sectors of Indian economy. As a consequence, the purely domestic firms or firms having only technological collaborations may be forced to sell abroad than in the domestic market.

All the variables related to capital and skill intensities of the firms i.e. VAN/N, W/N, and MR/W turn up significant with high positive coefficients supporting our a priori expectations regarding their favourable impact on export performance.

Conclusions and Policy Implications

Our study establishes the importance of skill factors and technological collaborations in determining the export performance of firms operating in the Machinery and Transport Equipment Industry. Skilled workers, whether they are employed for product innovation/adaptation, production engineering, or export marketing have contributed immensely to improved export performance. The importance of skilled worker in exports is in line with the reasoning of several works on technology and trade that have come to enrich the literature in recent years.[14] Greater skill intensity measured

13See Lall (1986), p.83

14See Dahlman and Westphal (1982), Katz (1984), Dahlman and Sercovich (1984), etc.

in terms of VA/N, W/N and MR/W, can expedite the learning economies in an industry or can lead to marketing and technological leadership, thereby creating export possibilities.

The results also support the general observations on India's engineering industry. It is widely felt that Indian firms usually fail to penetrate global markets on account of poor organization, lack of market intelligence, and obsolete technologies. Higher skill intensity can go a long way in remedying this scenario. This is shown by our results, as well. Interestingly, direct foreign investment measured in terms of foreign equity participation has had an adverse impact on export performance of our sample. This contradicts the predictions of the "product cycle" theory of trade.[15] Yet, it is in accordance with the experiences of many developing countries including India where most foreign controlled firms are operating to book monopoly rent and brand name premiums from the domestic market.[16]

The striking part of our result in this context is that while foreign equity has a negative impact on export performance, technological collaboration with foreign firms help in improving export performance. This can only be explained by the fact that while India's Machinery and Transport Equipment exports do indeed suffer from inefficient technologies, the way to overcome this deficiency cannot be encouragement to direct foreign investment by multinationals. Instead a carefully monitored economic liberalization, which permits access to suitable technology through collaboration agreements, can lead to increased export thrust by our Machinery and Transport Equipment industry.

Yet, another seemingly contradictory result is that while skill factors are important determinants of Indian Machinery and Transport Equipment exports. R & D expenditure is not. However, this again is acceptable. As has been explained before, in-house R & D undertaken by our firms have failed to bridge the technological gap. The R&D expenditure is too small and not appropriate to have a noticeable impact on exports, as it fails to deliver a marketable innovation. In contrast to this, the general on-job innovations by skilled workers or import of technology through licensing agreements serve to boost exports.

The study has some policy implications. The policies relating to the Machinery and Transport Equipment industry should be so designed that skill-endowment in the

---

15Vernon's (1966) "product cycle" theory has long emphasized the connection between corporate technological innovation and trade advantages. It argues that new products or processes are generated and introduced first in the MNC's own country, largely because they arise from meeting specific demands in the large domestic market. Comparative advantage and exports then grow out of home country. Later, other countries imitate or borrow in order to establish their own production or the MNC itself might decide to shift the location of production to a country where factors or production are cheaply available and marketing cost is low. In any case, the recipient country gains in terms of its enhanced technological capacity. Finally, taking advantage of such an opportunity some dynamic firms of the country may even begin to export or if already exporting may improve their competitiveness.

16A review of empirical literature relating to the impact of foreign collaborations and export performance shows mixed results. For instances, studies by Jenkins (1979) on Mexico, Torre (1974) on Latin America, Cohen (1975) on Korea show that foreign firms to be better on export front than the domestic firms. In contrast, Cohen (1975) on Singapore and Subramanian and Pillai (1979) on India found local firms to be performing better than the foreign firms.

industry is improved. The strategy for human resource development in the industry needs to be supplemented by appropriate and higher levels of indigenous R & D efforts. The economic liberalization should encourage the import of technology which can help in improving export performance. As the firms having larger number of licensing agreements have been found to do better in exports but not the firms with higher foreign equity participation, the technology transfer through latter requires careful examination.

References

AIEI (1985), Top 100 Engineering Companies, 1984, 1985 (New Delhi: Association of Indian Engineering Industries).

Alexander Committee (1978), Report of the Import and Export Policies, (New Delhi: Government of India, Ministry of Commerce).

Cohen, B. (1975), Multinational Firms and Asian Exports, (New Haven: Yale University Press).

Dahlman, C. J. and Sercovich, F. (1984), "Exports of Technology from Semi-Industrial Economies and Local Technological Development", *Journal of Development Economics*, Vol.16, pp. 63-100.

Dahlman, C., Lary, J, Westphal, E. (1982), "Technological Effort in Industrial Development - An Interpretive Survey of New Research," in: Steward, F., James, J. (eds), The Economics of New Technology in Developing Countries, pp. 105-37, (London:).

Davies N.V. (1986), Engineering Exports: How much? and When?, *The Economic Scene*, Dec. 1986, pp. 27-39.

de La Torre, J. (1974), "Foreign Investment and Export Dependency", Economic Development and Culture Change, Vol.23, No.1, pp. 133-50.

Desai, A. (1980), "The Origins and Direction of Industrial Research and Development in India" *Research Policy*, pp. 74-79.

DST (1984), Research and Development in Industry, 1981-82, 1982-83, 1983-84 (New Delhi: Department of Science and Technology, Government of India).

Glejser, H. A., Jaquemin and Petit, J. (1980), "Exports in an imperfect competition framework: an analysis of 1446 Exporters" *Quarterly Journal of Economics*, Vol. 94, pp. 507-524.

Gruber, W. H. and Vernon, R. (1970),"The Technology Factor in a World Trade Matrix", in Vernon R. (ed), The Technology Factor in International Trade.

Gruber, W. H., Mehta, D. and Vernon, R., "The R & D Factory International Trade and International Investment of U.S. Industries", *Journal of Political Economy*, Vol.75, February, pp. 20-37.

Hirsch, S. (1971), The Export Performance of Six Manufacturing Industries: A Comparative Study of Denmark, Holland and Israel, (New York: Praeger).

Hirsch, S. (1974), "Capital or Technology? Confronting the Neo-Factor Proportions and Neo-Technology Accounts of International Trade," *Weltwirtschaftliches Archiv*, Vol.110, pp. 535 – 557.

Hirsch, S. (1977), Rich Man's Poor Man's and Everyman's Goods: Aspects of Industrialisation, (Tubingen: JC B Mohr).

Hufbauer, G. C. (1970), "The impact of National Characteristics and Technology on the commodity Composition of Trade in Manufactured Goods" in Vernon, R. (ed.) The Technology Factory in International Trade.

Indian Investment Centre (1986), Industry wise Break up of Foreign Collaboration Cases approved by the Government of India During 1970-84, (New Delhi : Indian Investment Centre).

Jenkins, R. (1979), "The Export performance of Multinational Corporations in Mexican Industry", *Journal of Development Studies*, Vol.15, No. 3, pp. 89-207.

Katz, J. (1984), "Domestic Technological Innovations and Dynamic Comparative Advantage: Further Reflections on a Comparative Case Study Programme" Journal of Development Economics, Vol.16, pp. 13-38.

Lall, S. (1981), Developing Countries in the International Economy, (London: Macmillan, 1981).

Lall, S. and Kumar, R. (1981), "Firm Level Export performance in an Inward Looking Economy: The Indian Engineering Industry", *World Development*, Vol. 9, No.5, pp. 453-63.

Lall, S. and Mohammed S. (1983), "Technological Efforts and Disembodied Technology Export: An Econometric Analysis of Inter-Industry Variations in India", *World Development*, Vol. 11, No. 6, pp. 527-535.

Lall, S. and Mohammed S. (1983), Foreign Ownership and Export Performance in the large Corporate Sector of India", *Journal of Development Studies*, Vol. 20 No.1, pp. 56-67.

Lall,S. (1986), "Technological Development and Export Performance in LDCS : Leading Engineering and Chemical Firms in India, *Weltwirtshaftliches Archiv*, Bd,CXXII, pp. 81-91.

Lary, H. B., (1968), Imports of Manufactures from the Less Developed Countries, (New York : NBER).

Maddala, G. S. (1977), Econometrics, (New York: McGraw Hill).

Nayyar, D. (1976), India's Exports and Export-Policies in the 1960s, (Cambridge: Cambridge University Press).

Sen, S. (1982), "Policy Planning in the Foreign Trade Sector: From Import Substitution to Export Promotion in India", in the proceedings of the Indian Statistical Institute Golden Jubilee International Conference on Review of the Indian Planning Process, Calcutta, pp. 168-186.

Subramanian, K. K. and Pillai, P.M. (1979), Multinationals and Indian Exports: A Study of Foreign Collaboration and Export performance in Selected Indian Industries, (New Delhi: Allied Publications).

Tandon Committee (1980), Report of the Committee on Export Strategy, (New Delhi: Government of India, Ministry of Commerce).

Vernon, R. (1966), "International Investment and International Trade in the Product Cycle, "Quarterly Journal of Economics", Vol.80, pp. 190-207.

Vernon, R. (1970), The Technology Factor in International Trade (ed.), (New York: Columbia University Press, 1970).